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SELECTED DATA ON SOVIET BLOC PETROLEUM EXPORTS

CIA/RR MP-108
(ORR Project 25.25)

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This report outlines, in brief statistical form the petroleum production and refining capabilities of the Soviet Bloc. The purpose of this presentation of data is to provide a preliminary basis for gauging the petroleum export possibilities of the Bloc. The information given is in accord with current estimates and is arranged as follows:

- A. Distribution of Petroleum Products
- B. Petroleum Processing Facilities and Operations
- C. Petroleum Production, Reserves and Potential

A. DISTRIBUTION OF PETROLEUM PRODUCTS.

Exports of petroleum products from the Soviet Bloc have risen since 1950, from 0.7 million metric tons to nearly 2 million in 1952. Practically all of these exports have originated in the European Satellites, with Rumania and the Soviet Zone of Austria as the chief suppliers. Most of the increase has been registered in the residuals, which have nearly quadrupled, as shown in Table A-1.

As crude oil production in the Soviet Bloc has increased, the surplus of residual fuel has also increased. The expansion in cracking capacity has not kept pace with expansion in crude production. As a result, there is a limit to the amount of residual fuel that can be utilized as cracking stock. Also, since the Bloc economy is based almost entirely on coal, this residual fuel cannot be consumed internally. Therefore, there is an increasing quantity of residuals on hand that is available for export. The distillates, on the other hand, have been absorbed more readily by

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Detailed information on exports from the Soviet Bloc is more readily available for the year 1952. Table A-2 shows these shipments by origin, destination and major product groups. The Soviet Zone of Austria was the largest exporter, 54 percent of the total, and Western Austria was the largest recipient, also 54 percent of the total. Rumania was the second largest exporter, and the only other one of importance, with over 40 percent of the total. Over half of Rumania's exports went to Finland under a trade agreement between Finland and the Soviet Union.

In 1952, slightly more than 60 percent of the total exports was in the form of residual fuel, including lubricants. This compares with 45 percent in 1950 and 57 percent in 1951. In addition to the shipments recorded in Table A-2, there were probably small quantities of petroleum products exported by the USSR to Finland and by Eastern Austria to Western Germany. Also in 1952 Italy imported about 200,000 tons of crude oil, principally from the Soviet Union.

A comparison of Soviet Bloc exports with availability and internal requirements, shown in Table A-1, illustrates the inability of the Bloc to consume all the residual fuel produced and the resulting effort to dispose of the excess through export. The unaccounted for balance includes changes in inventories but, especially in the case of distillates, does not necessarily give a true surplus. Because of the probable margin of

error implicit in the production and requirements estimates, it is entirely possible that the excesses indicated may be high. Also a look at the increase in internal requirements shows that consumption of distillates has risen more rapidly than consumption of residuals. Therefore, it is probable that the relative importance of the excess of distillates will become less and less and may even decrease quantitatively.

In addition to offers made to the same countries listed in Table A-2, efforts have been made in 1953 to sell Bloc petroleum products in Greece, Argentina, Iceland, Egypt and Ethiopia. In the cases of the first three, agreements have already been signed. In each case, except Iceland, the product involved has been residual fuel. These offers total approximately 800,000 metric tons and the fuel would probably originate in Rumania. It is interesting to note that, in each of the countries involved, the quantity is important locally but not in the overall world fuel picture.

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TABLE A-1Estimated Soviet Bloc Petroleum Balance1950 - 1952Million Metric Tons

		1950	1951	1952
<u>Crude Petroleum Production</u> ^{1/}		45.5	52.3	58.8
<u>Petroleum Products Production</u> ^{2/}	Distillates	24.3	28.5	33.1
	Residuals ^{3/}	16.3	18.5	20.1
	<u>Total</u>	40.6	47.0	53.2
<u>Soviet Bloc Internal Requirements</u>	Distillates	22.1	24.3	27.8
	Residuals ^{3/}	15.8	17.2	18.2
	<u>Total</u>	37.9	41.5	46.0
<u>Soviet Bloc Exports</u>	Distillates	0.4	0.6	0.7
	Residuals ^{3/}	0.3	0.8	1.1
	<u>Total</u>	0.7	1.4	1.8
<u>Balance Unaccounted for</u> ^{4/}	Distillates	1.8	3.6	4.6
	Residuals ^{3/}	0.2	0.5	0.8
	<u>Total</u>	2.0	4.1	5.4

^{1/} Includes natural gas liquids.^{2/} Natural and synthetic.^{3/} Includes all types of lubricants.^{4/} Includes changes in inventories.~~SECRET~~

~~SECRET~~TABLE A-2Estimated 1952 Exports from the Soviet Bloc

(Thousand Metric Tons)

<u>Origin</u>	<u>Destination</u>	<u>Distillates</u>	<u>Residuals</u> ^{1/}	<u>Total</u>
Eastern Austria	Western Austria	400	600	1,000
Rumania	Finland	250	150	400
	Switzerland	0	200	200
	Italy	0	100	100
	Sweden	0	40	40
	Denmark	0	20	20
	Norway	0	10	10
	Sub-total	250	520	770
Soviet Zone of Germany	Western Germany	42	0	42
USSR	Belgium	24	0	24
	Netherlands	11	0	11
	Afghanistan	6	0	6
	Sub-total	41	0	41
<u>Grand Total</u>		<u>733</u>	<u>1,120</u>	<u>1,853</u>

^{1/} Includes all types of lubricants.~~SECRET~~

~~SECRET~~**B. PETROLEUM PROCESSING FACILITIES AND OPERATIONS**

Estimates of the currently installed petroleum processing facilities in the Soviet Bloc are shown in Tables B-1 to B-5, inclusive. Tables B-6 to B-10, inclusive, show estimates of the actual Soviet Bloc petroleum product yields, covering 1950, 1951, and 1952.

Generally, in the Soviet Bloc, in comparison with the natural crude oil refining practices in most Western countries, such as the US, the relative yields from the crude oil charge are lower in distillates and higher in residuals. This primarily arises from the lesser degree of modernization in the cracking and other conversion refining equipment in the Soviet Bloc. Particularly in the USSR, the country that furnished 77.6 weight percent of the estimated total Soviet Bloc petroleum products in 1952, this comparative status would probably persist to some extent even if the most modern types of conventional conversions were applied to the crudes.

Soviet natural crude oils present special problems with respect to refining. Notable features of a large portion of such crudes are as follows: (1) the stocks tend to have naphthenic and even aromatic base, and they tend to have relatively low percentage contents of virgin gasolines and other light straight-run distillates; (2) the stocks tend to be relatively high in contents of gas oil suitable for cracking, and likewise in heavy

types of thermal and catalytic cracking. The carbocyclic base in the light gas oils and more volatile distillates is desirable within limits, referring to potential octane ratings of products. However, the Soviet carbocyclic base crudes often tend to have (1) high sulphur contents and (2) poor quality characteristics in the heavy gas oil and residual portions.

An intensive program has been evident for several years in the USSR, involving reconstruction, modernization, and expansion of the natural crude oil refining facilities. The program was in progress through a period of rehabilitation of the facilities which were damaged during World War II, and has been continued. Beginning with the World War II period, the Soviets have been quite active in the installation of catalytic refining apparatus. However, it does not seem probable that the Soviets will attempt to attain a relative status in catalytic conversion such as that which exists in the US. This status would place heavy requirements upon Soviet industry to furnish the complex and specialized equipment for the installations. A high relative degree of catalytic conversion results in high quality and high relative yields of the gasolines. The Soviets, however, will probably be more interested in the light distillates, in general which are obtainable with less emphasis upon the catalytic techniques as compared with the simpler thermal processes.

In the Soviet technological literature there are significant reports on new and special technique experiments, specifically developed for the direct thermal and catalytic cracking of the relatively abundant heavy

gas oils and residual stocks. In most other petroleum areas of the world, the percentage yields are usually small enough, with respect to refractory stocks of that nature, to make impractical the special processing which is required to prevent excessive coke deposit incident to the cracking operation. Comparing 1953 with 1950, as shown in Table B-1, a significant increase in the modernization of the Soviet natural crude oil refining installations is indicated. This trend will probably continue.

The Soviet modernization program appears to have been effectively increased since 1950. Prior to 1953, however, it is not evident that the cumulative effect has been sufficient to warrant a change in the overall yield factors which were derived in detail for 1950. Beginning with 1953, it is probable that the modernization effects will have increasing influence upon the Soviet natural crude oil product yields. Table B-6 summarizes the comparable yields in 1950, as estimated for the USSR and as reported for the US. The Table B-6 data shows that the US operations obtained 9.6% (by weight) more in distillates, 6.3% (by weight) less in lubricants and residuals, and 3.3% (by weight) less in gas and process loss, in terms of the crude oil charge. Table B-7 summarizes the overall petroleum product yields in the USSR, as estimated for 1950, 1951, and 1952.

Natural crude oil refining facilities are reportedly being expanded and modernized in the Soviet Bloc Satellites, but not upon a

basis comparable with the USSR program. Table B-8 shows the estimated 1952 petroleum product yields in the Soviet Bloc, prorated to the individual Soviet Bloc countries. Tables B-9 and B-10 summarize the overall yield estimates for the Satellites and the Soviet Bloc in 1950, 1951, and 1952.

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TABLE B-1
Installed Petroleum Processing Capacities
Natural Petroleum Refining in the USSR

Thousands of Metric Tons per Year

Process	Stock	I, III, IV, V.	Xa, Xb.	IX, VI, VII.	IX, IX, VII.	XII	Total
Crude Distillation	Charge	29,050	4,160	8,430	2,000	1,290	44,920
Thermal Cracking	Charge	6,086	2,151	6,353	1,246	874	16,812
Thermal Reforming	Charge		218	771			989
Catalytic Cracking	Charge		380	374			754
Catalytic Alkylation	Alkylate		44	46			90
Catalytic Polymerization	Copolymer	30		60			90
Catalytic Hydrogenation	Is-o-octane			80			80
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Crude Distillation	Charge	30,000	4,800	18,150	2,500	1,300	56,150
Thermal Cracking	Charge)	10,000	2,400	7,450	1,300	500	21,650
Thermal Reforming	Charge)						
Catalytic Cracking	Charge	760	760	1,134			2,654
Catalytic Alkylation	Alkylate	96	90	142			328
Catalytic Polymerization	Copolymer	30	10	60			100
Catalytic Hydrogenation	Is-o-octane			80			80

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2. Available in 1953 (Preliminary Estimates)

B/ Economic Regions:

III - Ukraine

IV - Lower Don - Caucasus

V - Transcaucasus

IXa - Kazach SSR

IXb - Central Asia

IXc - Northern European USSR

VI - Volga

VII - Ural

IXa - Northwest

IXb - Baltic

IXc - Central European USSR

XII - Far East

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Installed Petroleum Processing Capacities Natural Petroleum
Refining in the Soviet Bloc Satellites Available in 1952 - 1953 a/

<u>Country</u>	<u>Thousands of Metric Tons per Year</u>	
	<u>Crude Distillation Charge</u>	<u>Thermal Cracking/Reforming Charge</u>
Rumania b/	8,050	2,500
Austrian Sovezone	2,000	300
Hungary	1,010	30
Czechoslovakia	390	50
Poland	370	20
German Sovezone	250	0
Bulgaria	60	0
Albania	50	0
China	<u>400</u>	<u>50</u>
Total	12,580	2,950

a/ Preliminary estimates.

b/ Small capacity catalytic facilities for polymerization, hydrogenation, and alkylation were reportedly installed in Rumania prior to the close of World War II. Present operability and operation status unknown.

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<u>Thousands of Metric Tons per Year</u>		
<u>Facilities Type</u>	<u>Location</u>	<u>Total Synthetic Oil Products</u>
Shale Oil Plants	Estonian SSR	300
Bergius Hydrogenation	Lake Baikal Area	<u>400</u>
Total		700

a/ Preliminary estimates.

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Table B-4

Installed Petroleum Processing Capacities
Synthetic Oil Facilities in the Soviet Bloc Satellites
Available in 1952 - 1953 a/

		Thousands of Metric Tons per Year
<u>Facilities Type</u>	<u>Area</u>	<u>Total Synthetic Oil Products</u>
Bergius/Fischer-Tropsch	German Sovzone	1,100
Coal Tar Distillation	German Sovzone	350
Lubricants Processing	German Sovzone	<u>25</u>
TOTAL	German Sovzone	1,475
Bergius	Czechoslovakia	350
Bergius	Poland	100
Various	China	<u>185</u>
TOTAL	Satellites <u>b/</u>	2,110

a/ Preliminary estimates.

b/ Bulgaria contains oil shale reserves of some extent. However, data are not presently available for commercial synthetic oil exploitation in Bulgaria or other Satellite areas except as shown.

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SECURITY INFORMATIONTABLE B-5Installed Petroleum Processing Capacities ^{a/}Soviet Bloc FacilitiesAvailable in 1953Thousands of Metric Tons per Year

<u>Types of Facilities or Products</u>	<u>Stock</u>	<u>Capacity</u>
<u>1. Processing Capacities</u>		
Crude Distillation ^{b/} ^{a/}	Charge	68,730
Thermal Cracking/Reforming ^{b/} ^{a/}	Charge	24,600
Catalytic Cracking ^{b/} ^{a/}	Charge	2,654
Catalytic Alkylation ^{b/}	Alkylate	328
Catalytic Polymerization ^{b/}	Copolymer	100
Catalytic Hydrogenation ^{b/}	Iso-octane	80
Synthetic Oil Plants	Oil Products ^{d/}	2,810
<u>2. Production Capacities ^{d/} ^{a/}</u>		
Natural Crude Oil Products	Oil Products	61,290
Synthetic Oil Products	Oil Products	<u>22,750</u>
Total Products	Oil Products	64,040

^{a/} Preliminary estimates; exclusive of facilities for recovery of natural gas liquids.^{b/} Natural crude oil processing facilities.^{c/} Cracking and reforming units can be operated concurrently together with the crude distillation units, to fractionate a natural crude oil charge approximately equal to the aggregate of the charge capacity ratings of the units. However, if a system is designed for a conversion process such as cracking or reforming, the equipment is not generally efficient in the crude distillation service. Further in an overall operation as thus described, the final products are essentially confined to the virgin components of the crude and are suitable only for emergency or temporary purposes as compared with the finished refined products obtainable by separate use of the conversion processes. The overall operation generally furnishes charge in reduced quantities for the gas severing processes such as alkylation and polymerization.^{d/} Non-gaseous petroleum products.^{e/} Net values of finished refined products for consumption, allowing for distribution loss but without deduction for petroleum product consumption within the petroleum industry itself. All conversion units assumed to be used for conversion.~~SECRET~~
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Table B-6
Comparison of Overall Natural Crude Oil Refining
USSR and US in 1950

<u>Stock</u>	<u>USSR</u>		<u>US</u>	
	<u>1,000</u> <u>Metric Tons</u>	<u>Weight</u> <u>%</u>	<u>1,000</u> <u>Metric Tons</u>	<u>Weight</u> <u>%</u>
Gasolines	10,017	28.1	105,321	37.3
Intermediate Distillates	9,077	25.5	73,166	25.9
Lubricants and Specialty Residuals	2,607	7.3	21,769	7.7
Residual Fuel Oil	10,718	30.1	66,066	23.4
Gas and Process Loss	<u>3,206</u>	<u>9.0</u>	<u>16,065</u>	<u>5.7</u>
Crude Oil Charge	35,625	100.0	282,387	100.0
Gas and Process Loss	<u>3,206</u>	<u>9.0</u>	<u>16,065</u>	<u>5.7</u>
Gross Non-Gaseous Products	32,419	91.0	266,322	94.3
Distribution Loss	<u>648</u>	<u>1.8</u>	<u>a/</u>	<u>a/</u>
Net Non-Gaseous Products	31,771	89.2	<u>a/</u>	<u>a/</u>

a/ Data not available.

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TABLE B-7

USSR

Estimated Annual Yields of Petroleum Products a/

	<u>Thousands of Metric Tons</u>		
	<u>1950</u>	<u>1951</u>	<u>1952</u>
<u>From Natural Petroleum</u>			
Gasolines	9,817	10,711	11,495
Intermediate Distillates	8,896	9,738	10,450
Lubricants and Specialty Residuals	2,554	2,794	2,999
Residual Fuel Oil	<u>10,506</u>	<u>11,493</u>	<u>12,333</u>
Total Refined Non-Gaseous Products b/	31,771	34,736	37,277
Process, Gas, and Distribution Loss	<u>3,856</u>	<u>4,214</u>	<u>4,523</u>
Crude Oil Charge to Refining	35,625	38,950	41,800
Unrefined Crude Oil Consumption b/	375	410	440
Crude Oil Field Losses	<u>1,500</u>	<u>1,640</u>	<u>1,760</u>
Total Crude Oil Production	37,500	41,000	44,000
Natural Gas Liquids a/	<u>300</u>	<u>1,100</u>	<u>3,000</u>
Total Petroleum Production	37,800	42,100	47,000
<u>From Synthetic Oil</u>			
Distillates a/	171	217	483
Lubricants and Residuals	<u>38</u>	<u>48</u>	<u>56</u>
Total Synthetic Oil Products a/	209	265	539
Distribution Loss	<u>4</u>	<u>5</u>	<u>11</u>
Total Synthetic Oil Plant Production	213	270	550
<u>Total Distillates a/ a/</u>			
Natural Gas Liquids	300	1,100	3,000
Natural Crude Oil Products	18,713	20,449	21,945
Synthetic Oil Products	<u>171</u>	<u>217</u>	<u>483</u>
Total Distillates	19,184	21,766	25,428
<u>Total Lubricants and Residuals a/</u>			
Unrefined Natural Crude Oil Product b/	375	410	440
Refined Natural Crude Oil Products	13,058	14,287	15,332
Synthetic Oil Products	<u>38</u>	<u>48</u>	<u>56</u>
Total Lubricants and Residuals	13,471	14,745	15,828
<u>Total Petroleum Products a/</u>			
Distillates a/	19,184	21,766	25,428
Lubricants and Residuals	<u>13,471</u>	<u>14,745</u>	<u>15,828</u>
Total Petroleum Products	32,655	36,511	41,256

a/ Net values for final consumption, allowing for distribution loss but without deduction for petroleum product consumption within the petroleum industry itself.

b/ Net storage increments assumed to be nominal and uniform for natural crude oil.

c/ Excluding lubricating oil distillates.

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TABLE B-8

Soviet Bloc

Estimated 1952 Indigenous Yields of Petroleum Products a/

Thousands of Metric Tons

	Natural Petroleum		c/ Synthetic Oil Products	Total Petroleum Products	Weight % Total Petroleum Products
	Estimated Natural Petroleum Production	Gas and Material Loss			
Rumania	7,200	936	0	6,264	11.78
Austrian Sovzone	3,200	116	0	2,784	5.23
Hungary	600	78	0	522	0.98
Albania	310	40	0	270	0.51
Poland	186	24	15	177	0.33
Czechoslovakia	60	8	289	341	0.64
Bulgaria	20	3	0	17	0.03
German Sovzone	0	0	1,274	1,274	2.40
Total European Satellites b/	11,576	1,505	1,578	11,649	21.90
Total Asiatic Satellites c/	235	30	78	283	0.53
Total Satellites	11,811	1,535	1,656	11,932	22.43
USSR	47,000	6,283	539	41,256	77.57
Total Soviet Bloc	58,811	7,818	2,195	53,188	100.00

a/ Finished refined non-gaseous products; net values available for consumption, allowing for distribution loss but without deduction for petroleum product consumption within the petroleum industry itself.

b/ Natural crude oil only.

c/ Communist China.

d/ Natural crude oil plus natural gas liquids.

e/ Provided to areas on basis of estimated total natural crude oil production within the areas, regardless of the area in which the natural crude oil was actually processed.

f/ Assumed to be indigenous; import-export balances for the natural crude oil with other countries neglected.

g/ As estimated for individual areas.

TABLE B-9**Soviet Bloc Satellites****Estimated Annual Yields of Petroleum Products ^{a/}**

	<u>Thousands of Metric Tons</u>		
	<u>1950</u>	<u>1951</u>	<u>1952</u>
<u>From Natural Petroleum</u>			
Distillates ^{b/}	4,099	5,438	6,186
Lubricants and Residuals	<u>2,710</u>	<u>3,595</u>	<u>4,090</u>
Total Refined Non-Gaseous Products ^{a/}	6,809	9,033	10,276
Total Gas and Material Loss	<u>1,018</u>	<u>1,350</u>	<u>1,535</u>
Total Petroleum Production	7,827	10,383	11,811
<u>From Synthetic Oil</u>			
Distillates ^{b/}	1,057	1,275	1,507
Lubricants and Residuals	<u>104</u>	<u>126</u>	<u>149</u>
Total Synthetic Oil Products ^{a/}	1,161	1,401	1,656
Distribution Loss	<u>24</u>	<u>29</u>	<u>34</u>
Total Synthetic Oil Plant Production	1,185	1,430	1,690
<u>TOTAL PETROLEUM PRODUCTS</u> ^{a/}			
Distillates ^{b/}	5,156	6,713	7,693
Lubricants & Residuals	<u>2,814</u>	<u>3,721</u>	<u>4,239</u>
Total Petroleum Products	7,970	10,434	11,932

^{a/} Net values for final consumption, allowing for distribution loss but without deduction for petroleum product consumption within the petroleum industry itself.

^{b/} Excluding lubricating oil distillates.

TABLE B-10**Soviet Bloc****Estimated Annual Yields of Petroleum Products ^{a/}**

	<u>Thousands of Metric Tons</u>		
	<u>1950</u>	<u>1951</u>	<u>1952</u>
Distillates ^{b/}	24,340	28,479	33,121
Lubricants and Residuals	<u>16,285</u>	<u>18,466</u>	<u>20,067</u>
Total Petroleum Products	40,625	46,945	53,188

^{a/} Net values for final consumption, allowing for distribution loss but without deduction for petroleum product consumption within the petroleum industry itself.

^{b/} Excluding lubricating oil distillates.

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C. PETROLEUM PRODUCTION, RESERVES AND POTENTIAL

The estimated production, proved reserves and potential resources of petroleum in the Soviet Bloc are shown in Table C-1. The information in this table is arranged in a self-explanatory manner.

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TABLE C-1

Estimated Production, Proved Reserves, and Potential Resources of Petroleum
in the Soviet Bloc and Comparison with the Free World

Item No.	Country or Area	Estimated Production		Annual Rate of Growth of Product 1948 - 1952 %	Estimated Proved Reserves Dec. 31, 1952	Ratio of Proved Reserves to Annual Production	All quantities in million metric tons		
		1948	1952				Potential Geologic Resources	Potential Economic Capabilities to Convert Resources to Use.	Potential Resources to Use.
1	USSR	29.2	47.0	2/	1,000	21	Large	Fair	
2	Rumania	4.2	7.2		70	10	Medium	Good	
3	Soviet Union	0.9	3.2		12	4	Small	Good	
4	Hungary	0.5	0.6		5	8	Medium	Fair	
5	Albania	0.2	0.3		2	7	Small	Poor	
6	Poland	0.1	0.2		2	10	Medium	Poor	
7	Czechoslovakia	6/	0.1		1	10	Small	Good	
8	Bulgaria	0.0	6/		1	10	Small	Poor	
9	China	0.1	0.2		5	25	Large	Poor	
10	Total Soviet Bloc	35.2	58.8		1,098	18.7	Large	Fair	
11	USA	291.7	333.2	1/	4,324	13.0	Medium	Good	
12	Middle East	55.9	102.0	2/	7,172	70.3	Large	Good	
13	Total Free World	449.4	584.6	2/	13,522	23.1	Large	Good	

1/ Petroleum for this purpose is defined as crude oil plus natural gas liquids.

2/ Includes up to 3 million tons of natural gas liquids conserved in 1952. Rise of these products were wasted in 1948.

3/ This growth rate reflects results of conservation program for saving natural gas liquids. Growth rate due to discovery and development of oil deposits is between 10 and 11 percent annually.

4/ Productive capacity of USA, Middle East and Free World is about 10% higher than actual production, not including 30 million tons annual production shut down in Iran.

5/ Growth in productive capacity is somewhat higher than the growth in production.

6/ Less than 0.05 million metric tons.